

IRRIGATION -SECTION 02810**PART 1- GENERAL****1.01 SUMMARY**

Work to be done includes all labor, materials, equipment and services required to complete the Project irrigation system as indicated on the Construction Drawings, and as specified herein. Includes but is not limited to: Furnishing and installing underground and above ground sprinkler system complete with any accessories necessary for proper function and operation of the system. All plant material on the Project shall be irrigated. Removal of existing sprinkler system components disturbed during construction process. Existing components removed shall be turned over to City. Restoration of existing landscape to original state and condition.

1.02 RELATED WORK

The following item(s) of related work are specified and included in other sections of the City's specifications. Section headings and reference numbers may not correspond exactly.

- A. Section 01815 – Testing
- B. Section 02200 – Earthwork
- E. Section 02900 – Planting
- C. Section 02910 – Seeding
- D. Section 02915 – Sodded Lawns
- E. Section 02920 – Landscape Fine Grading
- F. Section 02930 – Soil Preparation
- E. Section 02970 – Landscape Maintenance
- F. Section 16000 – Electrical

1.03 SYSTEM DESCRIPTION

- A. Design of irrigation components: Locations of irrigation components on Construction Drawings may be approximate. Piping, sleeving and/or other components shown on Construction drawings may be shown schematically for graphic clarity and demonstration of component groupings and separations. All Irrigation components shall be placed in landscaped areas, with the exception of pipe and wire in sleeving under hardscapes.
- B. Construction requirements: Actual placement may vary as required to achieve a minimum of 100% coverage without overspray onto hardscape, buildings or other features.

- C. Layout of Irrigation Components: During layout and staking, consult with Owner's Representative to verify proper placement of irrigation components and to provide Contractor recommendations for changes, where revisions may be advisable. Small or minor adjustments to system layout are permissible to avoid existing field obstructions such as utility boxes or street light poles. Contractor shall place remote control valves in groups as practical to economize on quantity of valve clusters. Quick coupler valves shall be placed with valve groups as shown on plans.

1.04 DEFINITIONS

- A. Water Supply
Culinary or Secondary piping and components, furnished and installed by others to provide irrigation water to this Project. Including but not limited to saddles, nipples, spools, shut off valves, corporation stop valves, water meters, pressure regulation valves, and piping upstream of (or prior to) the Point of Connection.
- C. Point of Connection: Location where the Contractor shall tie into the water supply. May require saddle, nipples, spools, isolation valves or Stop & Waste valve for landscape irrigation needs and use.
- D. Main line piping: Pressurized piping downstream of the Point of Connection to provide water to remote control valves and quick couplers. Normally under constant pressure.
- E. Lateral line piping: Circuit piping downstream of remote control valves to provide water to sprinkler heads, drip systems or bubblers.

1.05 REFERENCES

The following standards will apply to the work of this Section:

- A. ASTM – American Society for Testing and Materials
- B. NFPA 70 – National Electric Code
- C. IA – The Irrigation Association: Main BMP Document, Landscape Irrigation Scheduling and Water Management Document.
- D. ASIC – American Society of Irrigation Consultants: ASIC Grounding Guideline.
- D. South Jordan City – City code/ordinance Exhibit A, Chapter 11.30

1.06 SUBMITTALS

At least thirty (30) days prior to ordering of any materials, the Contractor shall provide manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system. Submittals shall be in three ring binders or other similar bound form. Provide five copies of submittals to Landscape Architect for distribution to Irrigation Designer. Place cover or index sheet indicating order in submittal document. Submittals shall be organized in the same order as the Approved Materials table shown in Section 2.01 of this document. No material shall be ordered, delivered or any work preceded in the field until the required submittals

have been reviewed in its entirety and stamped approved. Delivered material shall match the approved samples.

A. Operation and Maintenance Manual:

1. At least thirty (30) days prior to final inspection, the Contractor shall provide Operation and Maintenance manual to Irrigation Designer, containing:
 - a. Manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system.
 - b. Parts list for each operating element of the system.
 - c. Manufacturer printed literature on operation and maintenance of operating elements of the system.
 - d. Section listing instructions for overall system operation and maintenance. Include directions for Spring Start-up and Winterization.

B. Project Record Copy

1. Maintain at project site one copy of all project documents clearly marked "Project Record Copy". Mark any deviation in material installation on Construction drawings. Maintain and update drawing at least weekly. Project Record Copy to be available to Irrigation Designer or Owner's Representative on demand.

C. Completed Project As-built Drawings:

1. Prior to final inspection, prepare and submit to Irrigation Designer accurate as-built drawings.
2. Show detail and dimension changes made during installation. Show significant details and dimensions that were not shown in original Contract Documents.
3. Field dimension locations of sleeving, points of connection, main line piping, wiring runs not contained in main line pipe trenches, valves and valve boxes, quick coupler valves.
4. Dimensions are to be taken from permanent constructed surfaces, features or finished edges located at or above finished grade.

D. Controller map:

1. Upon completion of system, place in each controller, a color-coded copy of the area that controller services; indicating zone number, type of plant material and location on project that zone services. Laminate map with heat shrink clear plastic.

1.07 QUALITY ASSURANCE

A. Acceptance:

1. Do not install work of this section prior to acceptance by Landscape Architect of area to receive such work.

B. Regulatory requirements:

1. All work and materials shall be according to any and all rules, regulations or codes, whether they are State or Local laws and ordinances. Contract documents, drawings or specifications may not be construed or interpreted to permit work or materials not conforming to the above codes.

C. Adequate water supply:

1. Water supply to this portion of landscape irrigation system exists, installed by others. Connections to these supply lines shall be by this Contractor. Verify that proper connection is available to supply line, and is of adequate size. Verify that secondary connection components may be installed if necessary. Perform static pressure test prior to commencement of work.
2. Notify Owner's Representative in writing of problems encountered prior to proceeding.

D. Workmanship and Materials:

1. It is the intent of this specification that all material herein specified and shown on the construction documents shall be of the highest quality available and meeting the requirements specified.
2. All work shall be performed in accordance with the best standards of practice relating to the trade.

E. Contractor Qualifications:

1. Contractor shall provide document or resume including at least the following items:
 - a. That Contractor has been installing sprinklers on commercial projects for ten previous consecutive years.
 - b. Contractor is licensed to perform landscape construction in the State of Utah.
 - c. Contractor is bondable for the work to be performed.
 - d. References of five projects of similar size and scope completed within the last ten years. Three of the projects listed shall be local.
 - e. Listing of suppliers where materials will be obtained for use on this Project.

- f. Project On-site Foreman or Supervisor has at least five consecutive years of commercial irrigation Installation experience. This person shall be a current Certified Irrigation Contractor in good standing as set forth by the Irrigation Association. This person shall be on Project site at least 75% of each working day.
- g. Evidence that Contractor currently employs workers in sufficient quantities to complete Project within time limits that are established by the Contract.
- h. List of employees to be assigned to this Project and their irrigation installation experience.
- i. All General laborers or workers on the Project shall be previously trained and familiar with sprinkler installation, and have a minimum of one-year experience. Those workers performing tasks related to PVC pipe and electrical components shall have certificates designated below:
 - j. All workers engaged in handling, assembling and gluing of PVC pipe shall carry on Project site a certificate of training from the IPS factory representative authorizing said worker to prime and glue PVC pipe. (Contact Bill Godwin, G & S Sales, 801 972-0659).
 - k. All workers engaged in the handling and installation of buried power wire, remote control valve wire, wire connectors, controllers and grounding equipment shall carry on Project site a certificate of training from Paige Wire factory representative authorizing said worker to install wire, wire connectors and grounding equipment. (Contact Vince Nolletti, Vice President Irrigation Operations, Paige Electric Co., LP, 559-431-2346).
 - l. All workers engaged in the handling and installation of low volume tubing, emission devices and other low volume components shall carry on Project site a certificate of training from Netafim USA factory representative authorizing said worker to install low volume irrigation equipment. (Contact Kelly Keicher, District Sales Manager, Netafim USA, 303 805-7830).
- m. Documents verifying Certified Irrigation Contractor, PVC pipe certification and electrical component certification shall be provided at least 60 days in advance of any irrigation installation on Project site.

1.08 DELIVERY—STORAGE—HANDLING

During delivery, installation and storage of materials for Project, all materials shall be protected from contamination, damage, vandalism and prolonged exposure to sunlight. All material stored at Project site shall be neatly organized in a compact arrangement and storage shall not disrupt Project Owner or other trades on Project site. All material to be installed shall be handled by

Contractor with care to avoid breakage or damage. Damaged materials attributed to Contractor shall be replaced with new at Contractor's expense.

1.09 SEQUENCING

Perform site survey, research utility records, contact utility location services. The Contractor shall familiarize himself with all hazards and utilities prior to work commencement. Install sleeving prior to installation of concrete, paving or other permanent site elements. Irrigation system Point of Connection components, backflow prevention and pressure regulation devices shall be installed and operational prior to all downstream components. All main lines shall be thoroughly flushed of all debris prior to installation of Remote Control Valves. All lateral lines shall be thoroughly flushed of all debris prior to installation of any sprinkler heads. Irrigation Contractor shall be required to submit detailed Construction Schedule to Owner prior to commencement. Schedule shall be updated weekly.

1.10 WARRANTY

Contractor shall provide one year Warranty. Warranty shall cover all materials, workmanship and labor. Warranty shall include filling and or repairing depressions or replacing turf or other plantings due to settlement of irrigation trenches or irrigation system elements. Valve boxes, sprinklers or other components settled from original finish grade shall be restored to proper grade. Irrigation system shall have been adjusted to provide proper, adequate coverage of irrigated areas.

1.11 OWNER'S INSTRUCTION

After system is installed, inspected and approved, instruct Owner's Representatives in complete operation and maintenance procedures. Coordinate instruction with references to previously submitted Operation and Maintenance Manual.

1.12 MAINTENANCE

A. Furnish the following items to Owner's Representative:

1. Two quick coupler keys with hose swivels.
2. One of each type or size of quick coupler valve and remote control valve.
Five percent of total quantities used of each sprinkler and sprinkler nozzle.

B. Provide the following services:

Winterize entire irrigation system installed under this contract. Winterize by 'blow-out' method using compressed air. Compressor shall be capable of minimum of 175 CFM. This operation shall occur at the end of first growing season after need for plant irrigation but prior to freezing. Compressor shall be capable of evacuating system of all water from main line pipe and lateral line pipe. **Contractor shall retrofit compressor with adjustable pressure regulation device. Compressor shall be regulated to not more than 60 PSI.** Start up system the following spring after danger of freezing has passed. Contractor shall train Owner's Representative in proper start-up and winterization procedure.

PART 2 – PRODUCTS**2.01 GENERAL NOTES**

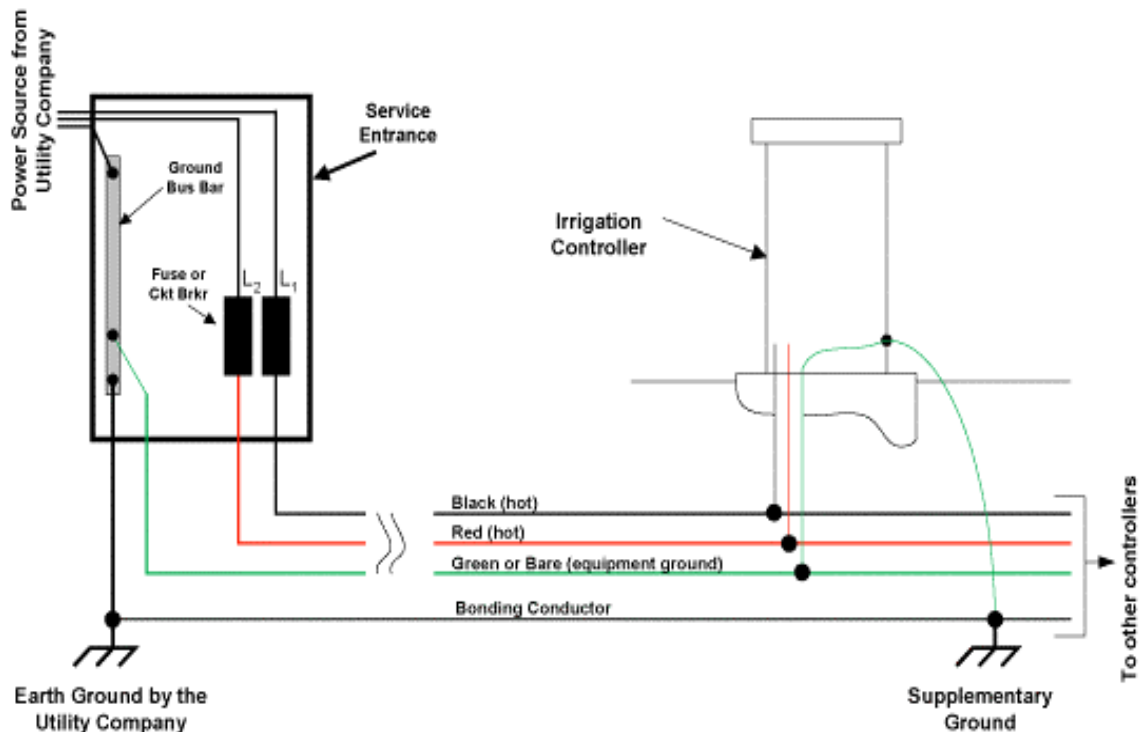
- A. Contractor shall provide materials to be used on this Project. Contractor shall not remove any material purchased for this Project from the Project Site, nor mix Project materials with other Contractor owned materials. Owner retains right to purchase and provide project material.

2.02 POINTS OF CONNECTION

- A. Contractor shall make use of existing pipes at or near the locations shown. Verify pipe size through South Jordan Parks or Water Department personnel or by field 'pothole'.
 - a. Order of installation shall proceed as follows:
 - A. Field adapt connection as necessary to existing conditions. Componentry shall be brass or bronze.
 - B. Install new Stop & Waste, which shall have brass nipples not less than 6" long on either side. Pipe main from downstream nipple elevation to 18" depth.
 - C. Install Backflow Prevention device.
 - D. Install Master valve/flow meter combination.
 - E. Install quick coupler downstream of meter.
 - b. Components shall be installed per Construction Documents and details; specifications designated in this section and Manufacturer's recommendations.
- B. Configuration, location and installation of POC and POC components shall be arranged such that distance from City main to downstream side of Master valve shall be as short as possible.

2.03 CONTROL SYSTEM

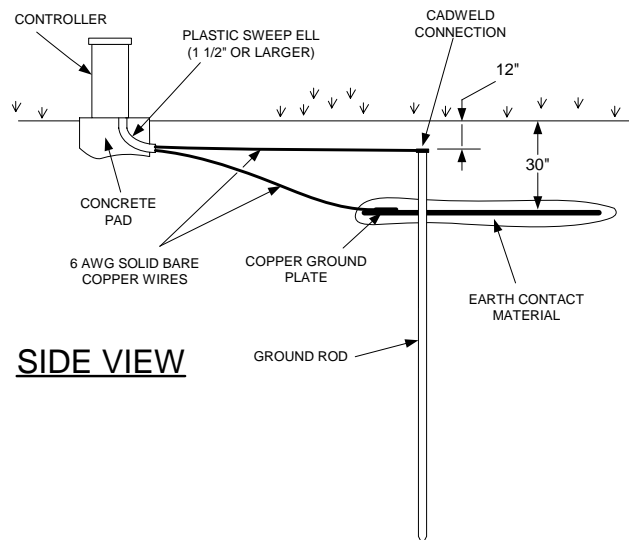
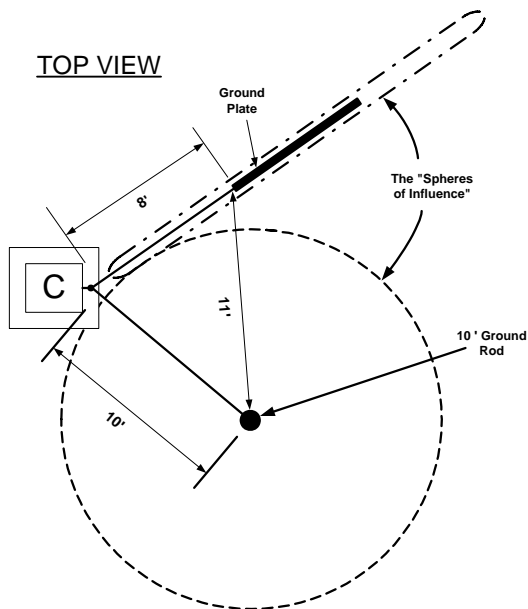
- A. Power supply to irrigation controller (Strong Box installation and Meter base with load center) **shall not** be included in the irrigation portion of this Project. Power supply shall be a part of other Contracts associated with this Project. See Electrical Construction Documents and Specifications for information and/or detail. Controller power wire from load center(s) to Controller **shall** be a part of this Contract.
- B. Controller power wire for pedestal controllers shall be: Paige Electric Co., model number P7266D, 12AWG, 2 or 3 conductor w/ground tray cable, direct bury. **NO SUBSTITUTIONS.** All power cables are type Tray Cable; shall be UL listed for direct burial, and rated at 600 volts. The cable shall include three conductors, which are to be colored or numbered as 1, 2, and 3, and shall be color-coded (using 3M #35 Vinyl Electrical Color Coding Tape) to code and electrical industry standards. The size of the "hot" and "common" conductors are to be as shown on the irrigation plans, and the size of the "ground" conductor as required by the National Electrical Code, or larger. The inner copper conductors shall be insulated with high dielectric PVC and Nylon. The outer jacket will be black PVC and is to be sunlight resistant. Paige Electric Co., LP specification number P7266D for 10 AWG and smaller and specification number P7267D for 8 AWG and larger.



C. Earth Grounding

- a. It is the responsibility of the installer to connect all electronic irrigation equipment for which he is responsible, to earth ground in accordance with Article 250 of the National Electrical Code® (NEC®.) Use grounding electrodes that are UL® listed or manufactured to meet the minimum requirements of Article 250 of the 2005 edition of the NEC®. At the very minimum, the grounding circuit will include a copper clad steel ground rod, a solid copper ground plate and 100 pounds of PowerSet® earth contact material, as defined below and per the following detail. This detail is the minimum requirement for supplementary grounding of any electronic equipment.
- b. The ground grid components must be installed with the dimensional relationships shown in the detail above. WIRES, CABLES, AND ELECTRONIC EQUIPMENT MUST BE INSTALLED OUTSIDE "THE SPHERE OF INFLUENCE" OF THE GROUNDING ELECTRODES.
- c. Ground rods are to have a minimum diameter of 5/8" and a minimum length of 10 feet. These are to be driven into the ground in a vertical position or an oblique angle not to exceed 45 degrees at a location 10 feet from the electronic equipment. The rod is to be stamped with the UL® logo [Paige Electric part number 182007.] A 6 AWG solid bare copper wire (about 12 feet long) shall be connected to the ground rod by the installer using a Cadweld GR1161G "One-Shot" welding kit [Paige Electric part number 1820037.] This wire shall be connected to the electronic equipment ground lug.

- d. The copper grounding plate assemblies shall be 4" x 96" x 0.0625" [Paige Electric part number 182199L.] A 25-foot continuous length (no splices allowed unless using exothermic welding process) of 6 AWG solid bare copper wire is to be attached to the plate by the manufacturer using an approved welding process. This wire is to be connected to the electronic equipment ground lug. If the equipment ground lug only accepts one wire, connect the second wire to the first with a brass split bolt, as close to the equipment lug as possible. The ground plate is to be installed to a minimum depth of 30", or below the frost line if it is lower than 30", at a location 8 feet from the electronic equipment and underground wires and cables.
- e. Two 50-pound bags of PowerSet® [Paige Electric part number 1820058] earth contact material must be spread so that it surrounds the copper plate evenly along its length within a 6" wide trench. Salts, fertilizers, bentonite clay, cement, coke, carbon, and other chemicals are not to be used to improve soil conductivity because these materials are corrosive and will cause the copper electrodes to erode and become less effective with time. Install all grounding circuit components in straight lines. When necessary to make bends, make sweeping turns, as shown. When connecting bare copper wire to the ground lug of electronic equipment, it must be fed through a dedicated 1.5" plastic sweep ell.



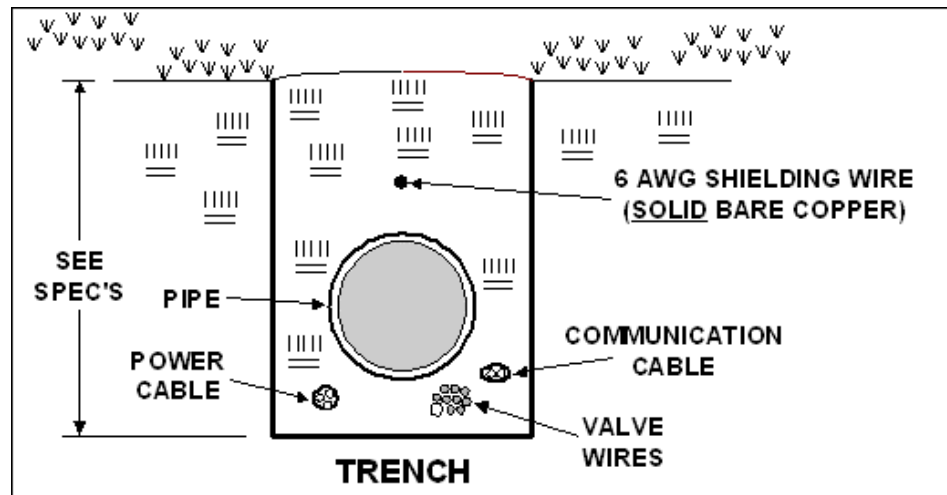
- f. The earth-to-ground resistance of this circuit is to be measured using a Megger®, or other similar instrument, and the reading is to be no more than 10 ohms. If the resistance is more than 10 ohms, additional ground plates and PowerSet® are to be installed using ASIC Guidelines 100-2002 (www.asic.org, "Design Guides".) It is required that the soil surrounding copper electrodes within the sphere of influence be kept at a minimum moisture level of 15% at all times.
- g. All underground circuit connections are to be made using an exothermic welding process by utilizing products such as the Cadweld "One-Shot" kits. Solder shall not

be allowed to make connections. In order to ensure proper ignition of the “One-Shot”, the Cadweld T-320 igniter must be utilized [Paige Electric part number 1820040.] The 6 AWG bare copper wires are to be installed in as straight a line as possible, and if it is necessary to make a turn or a bend it shall be done in a sweeping curve with a minimum radius of 8” and a minimum included angle of 90°. Mechanical clamps shall be permitted temporarily during the resistance test process, but are to be replaced with Cadweld “One-Shot” kits immediately thereafter.

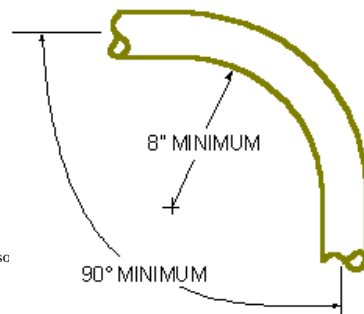
- h. ALL GROUNDING COMPONENTS MUST BE CONNECTED TO THE EQUIPMENT BEFORE ANY OTHER CONNECTION IS MADE.

D. Bonding/shielding

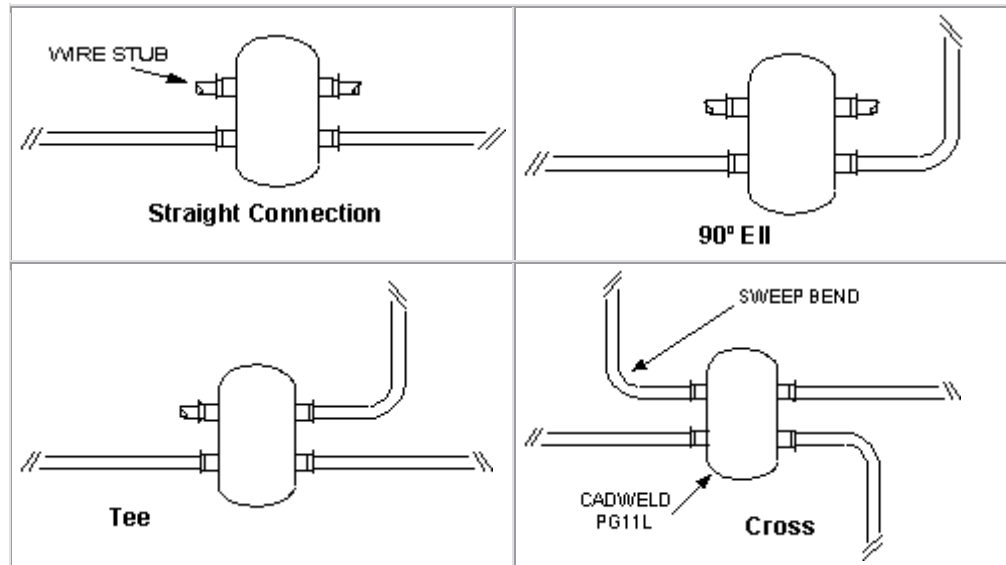
- a. The bonding conductors are to be installed in such a way so that they also act as shielding conductors. This becomes a network of solid bare copper wire over all the main bundles of other wires and cables as shown in the detail below.



- b. The bare copper wire is to be installed as close to the surface as possible, yet being sufficiently below the ground level as to prevent damage from maintenance equipment such as aerators. And it must be placed above all other valve / power / communication wires and cables, per detail, and installed in all trenches as shown on the electrical plan drawings. It is not necessary to install this conductor over short wire runs (less than 150 feet) away from the main wire bundles. The conductor is laid in as straight a line as possible, and when necessary to make bends, do so in a sweeping motion using the following detail as a guideline.
- c. Note: When connecting bare copper wires to the ground lug of electronic equipment, feed it through a dedicated 1 ½" plastic sweep ell to automatically meet the requirements of the “sweep bend” shown here.



- d. The shield network is to be connected to the service entrance earth ground, to all electronic equipment ground lugs, and all equipment supplementary grounding electrodes. One such network is necessary for each power source. Do not interconnect the equipment ground wires from different power sources. When joining bare copper wires, do so using an ERICO PG11L "One-Shot" kit as shown in the details below. [Paige Electric part number 1820074.]



- E. Controllers shall be Hunter Industries or Signature Control Systems. Controller shall be surge protected.
- Power configuration for pedestal controllers shall be 240 VAC or 120VAC. Wall mount type controller shall be 120 VAC. Install wall mount controllers within buildings or within Strong Box Combination Meter Base.
 - Controller shall be as indicated on Construction Drawings. Locate Controller in general location shown on Construction drawings. Contractor shall be responsible for all power connections to Controller. Contractor shall be responsible for electrical or other Project trades as needed to facilitate installation of power to controllers.
- F. Wires connecting the remote control valves to the irrigation controller are single conductors, type PE, Paige Electric Co., LP specification number P7079D. **NO SUBSTITUTIONS.** Wire construction shall incorporate a solid copper conductor and polyethylene (PE) insulation with a minimum thickness of 0.045 inches. The wires shall be UL listed for direct burial in irrigation systems and be rated at a minimum of 30 VAC.
- A minimum of 24" of additional wire shall be left at each valve, each splice box and at each controller.
 - Common wire shall be white in color, 12 gauge.** Control wire shall be red in color, 14 gauge. Spare wire shall be blue in color, 14 gauge.
 - One spare wire from every valve grouping containing three or more valves shall be 'home run' to the controller. Install at least one spare wire for every five valves.

Total number of spare wires shall not be less than 1/5th of the total control valves installed. Spare wire shall be looped within each valve box of the grouping it is to service.

- G. RCV wire splicing connectors shall be 3M brand DBY or DBR. **NO SUBSTITUTIONS.** Wire splicing between controller and valves shall be avoided if at all possible. Any wire splices shall be contained within a valve box. Splices within a valve box that contains no control valves shall be stamped 'WIRE SPLICE' or 'WS' on box lid.
- H. Communication wire/Sensor wire shall be Paige brand, model 7171D or P7315D (PE 39). **NO SUBSTITUTIONS.** Wire splicing or connection shall be made using Paige brand, model 273211 (3M SliC) and Paige brand, model 270228R (3M 316IR). **NO SUBSTITUTIONS.**

2.04 SLEEVING

- A. Contractor shall be responsible to protect existing underground utilities and components. Sleeving minimum size shall be 2". Sleeving 2" through 4" in size shall be S/40 PVC solvent weld. Sleeving 6" and larger shall be CL 200 PVC gasketed. Sleeve diameter shall be at least two times the diameter of the pipe within the sleeve. Sleeves shall be extended 6" minimum beyond walk or edge of pavement. Wire or cable shall not be installed in the same sleeve as piping, but shall be installed in separate sleeves. Sleeve ends on sleeve sizes 4" and larger shall be capped with integral, corresponding sized PVC slip cap, pressure fit, until used, to prevent contamination. Sleeve ends on sleeve sizes 3" and smaller may be thoroughly taped to prevent contamination. Sleeves shall be installed at appropriate depths for main line pipe or lateral pipe.

2.05 MAIN LINE PIPE

- A. All main line pipe 4" and larger shall be Class 200 gasketed bell end. All main line pipe 3" in size and smaller shall be Schedule 40 PVC solvent weld bell end. Maximum flows allowed through main line pipe shall be:
- | | | |
|-----|--------|-------------|
| 22 | GPM--- | 1-1/4" pipe |
| 30 | GPM--- | 1-1/2" pipe |
| 50 | GPM--- | 2" pipe |
| 75 | GPM--- | 2-1/2" pipe |
| 100 | GPM--- | 3" pipe |
| 200 | GPM--- | 4" pipe |
| 400 | GPM--- | 6" pipe |
- Main line pipe shall be buried with 18" cover.

2.06 MAIN LINE FITTINGS

- A. All main line fittings 3" and larger shall be gasketed ductile iron material. All ductile iron fittings having change of direction shall have proper concrete thrust block installed. All main line fittings smaller than 3" in size shall be Schedule 80 PVC.

2.07 ISOLATION VALVES

- A. Isolation valves 3" and larger shall be Waterous brand model 2500 cast iron gate valve, resilient wedge, push on type, with 2" square operating nut. Place sleeve of 6" or larger

pipe over top of valve vertically and then extend to grade. Place 10" round valve box over sleeve at grade. See detail for additional information.

- C. Isolation valves 2-1/2" and smaller shall be Apollo brand 70 series brass ball valves, contained in a Carson Standard size valve box. Valves shall be installed with S/80 PVC TOE Nipples one both sides of valve. Valve shall be placed so that the shut of handle is on the side rather the top of the valve. Valve shall be placed so that the handle is vertical toward the top of the valve box in the 'off' position.

2.08 MANIFOLDS

- A. Action Manifold fittings shall be used to create unions on both sides of each control valve, allowing the valve to be removed from the box without cutting piping. Valves shall be located in boxes with ample space surrounding them to allow access for maintenance and repair. Where practical, group remote control valves in close proximity. See remote control valve manifold detail for more information.

2.09 REMOTE CONTROL VALVES

- A. Remote control valves shall be Hunter brand, ICV-XX1G-AS. Master Valves shall also be Hunter brand or as designated on plans. Remote control valves shall be located separately and individually in separate control boxes.

1. Flows through 1" valves shall be 1-25 GPM.
2. Flows through 1-1/2" valves shall be 26-50 GPM.
3. Flows through 2" valves shall be 51 through 75 GPM.
4. Flows through 3" valves shall be 76 GPM through 200 GPM.

2.10 MANUAL CONTROL VALVES

- A. Quick coupler valves shall be HUNTER brand, model HQ-44LRC-AW 1" acme thread quick coupler. Quick coupler valve shall be attached to the main line using a Lasco G17S212 swing joint assembly with snap-lok outlet and brass stabilizer elbow. Quick coupler valve shall be placed within a Carson 10" round valve box. Top of quick coupler valve cover shall allow for complete installation of valve box lid, but also allow for insertion and operation of key. Base of quick coupler valve and top of quick coupler swing joint shall be encased in 3/4" gravel. Contractor shall place quick coupler valves as shown on plan. Quick coupler valves are not protected by an isolation valve. Quick coupler valve at POC shall not be eliminated or relocated.

2.11 LATERAL LINE PIPE

- A. All lateral piping shall be Schedule 40 PVC, solvent weld, and bell end. Lateral pipe shall be buried with 12" of cover typically. Lateral pipe shall be 1", 1-1/4", 1-1/2" or 2" in size as indicated on Construction Drawings.
Maximum flows allowed through lateral pipe shall be:
13 GPM—1" pipe
22 GPM---1-1/4" pipe

30 GPM—1-1/2" pipe
50 GPM—2" pipe
75 GPM---2-1/2" pipe
No other pipe sizes shall be used on this Project.

2.12 LATERAL LINE FITTINGS

- A. All lateral line fittings shall be S/40 PVC.

2.13 BUBBLER SPRINKLERS

- A. Bubbler sprinklers shall be Rain Bird brand Root Watering System, model RWS-M-BCG. Where indicate on Construction Documents, place 3 equilaterally per tree.

2.14 SPRAY SPRINKLERS

- A. Spray head sprinklers shall be Hunter brand, model INST-XX-CV. Nozzles shall be Hunter brand. Contractor shall use fixed spray wherever possible. Adjustable nozzles shall only be used where a fixed spray option is not available. Swing joint assembly shall be composed of the following: Two 1/2" spiral barb elbows, 12-24" swing pipe, one M412-005 1/2" marlex street 90.

2.15 MID SIZE ROTOR SPRINKLERS

- A. Mid size rotor head sprinklers shall be Hunter brand.
- Model I-20-XXS-XX, stainless steel stem rotor with check valve installed for 4" pop-ups.
 - Model I-20-6P-XXS stainless steel stem rotor with check valve installed for 6" pop-ups.
 - Model I-20-HP-XXV-XX vinyl stem rotor with check valve installed for 12" pop-ups.
 - Model I-10-XXV-XX vinyl stem shrub rotor with check valve installed.
- B. Contractor shall install nozzles designated on Construction Documents as appropriate for coverage and uniformity.
- C. Swing joints for pop-up rotors shall be composed of the following: One 12" S/80 threaded nipple (extruded, cut and threaded—not molded), and three marlex street elbows (one at the fitting, two at the base of the rotor).
- D. Swing joints for shrub rotors shall be composed of the following: two marlex street elbows at the PVC tee or elbow, one S/80 nipple not less than 24", one rotor stake kit, one 1/2" rebar, length as needed.

2.16 LARGE ROTOR SPRINKLERS

- A. Large rotor head sprinklers shall be Hunter brand, model I-40-XXS-XX, stainless steel stem rotor with check valve installed.
- B. Contractor shall install nozzles designated on Construction Documents as appropriate for coverage and uniformity.
- C. Swing joints shall be composed of the following: One 12" S/80 threaded nipple (machined, cut and threaded—**not molded**), and three marlex street elbows (one at the fitting, two at the base of the rotor).

2.17 VALVE BOXES

- A. Carson valve boxes shall be used on this project. Sizes are as directed in these Specifications, detail sheets or plan sheets. Valve boxes shall be centered over the control valve or element they cover. Valve box shall be sized large enough to allow ample room for service access, removal or replacement of valve or element. Valve box shall be set to flush to finish grade of topsoil or barked areas. Contractor shall provide extensions or stack additional valve boxes as necessary to bring valve box pit to proper grade.

2.18 IMPORT BACKFILL

- A. All main line pipe, lateral line pipe and other irrigation elements shall be bedded and backfilled with clean soil, free of rocks 1" and larger. Contractor shall furnish and install additional backfill material as necessary due to rocky conditions. Trenches and other elements shall be compacted and/or water settled to eliminate settling. Debris from trenching operations un-usable for fill shall be removed from project and disposed of properly by Contractor.

2.19 OTHER PRODUCTS

- A. Products designated as 'NO SUBSTITUTIONS' shall not be subject to change.
- B. Substitution of equivalent products is subject to the Irrigation Designer's approval and must be designated as accepted in writing.
- a. The Contractor shall provide materials to make the system complete and operational.

2.20 SPECIFIED / APPROVED MATERIALS

MATERIAL	MANUFACTURER
COMBO POWER PEDESTAL CONTROLLER ENCLOSURE	VIT STRONG BOX
METER/PANEL COMBO	SQUARE D
CONTROLLER	HUNTER, SIGNATURE
GROUNDING GRID	PAIGE
PEDESTAL BASE	VIT STRONG BOX
PVC SLEEVING	CERTAINTED, CRESLINE WEST, JM
WIRE	PAIGE
WIRE SPLICES	3M
MAIN LINE PIPE	CERTAINTED, CRESLINE WEST, JM
ISOLATION VALVES	WATEROUS (LARGE) APOLLO (SMALL) CONBRACO (DRAIN)

MAIN LINE FITTINGS	HARCO LASCO, SPEARS
MASTER VALVE	HUNTER
MANIFOLD COMPONENTS	ACTION
REMOTE CONTROL VALVES	HUNTER
QUICK COUPLER VALVES	HUNTER
QUICK COUPLER VALVE SWING JOINT	LASCO
LATERAL LINE PIPE	CERTAINTEED, CRESLINE WEST, JM
LATERAL LINE FITTINGS	LASCO, SPEARS
RIGID SWING JOINTS: NIPPLES MARLEX STREET ELBOW	EXCALIBUR LASCO, SPEARS
ROTOR HEAD	HUNTER
SPRAY HEAD	HUNTER
DRIP PRODUCTS	NETAFIM
PVC NIPPLES	EXCALIBUR
VALVE BOXES	RAIN BIRD
GLUE/PRIMER	IPS

PART 3 – EXECUTION**3.1 PREPARATION**

- A. Contractor shall repair or replace work damaged by irrigation system installation. If damaged work is new, replacement or the original installer of that work shall perform repairs. The existing landscape of this Project shall remain in place. Contractor shall protect and work around existing plant material. Coordination of trench and valve locations shall be laid out with Owner's Representative prior to any excavation occurring. Plant material deemed damaged by the Owner's Representative shall be replaced with new plant material at Contractors expense. Contractor shall not cut existing tree roots larger than 2" to install this Project. Route pipe, wire and irrigation elements around tree canopy drip line to minimize damage to tree roots. Contractor shall have no part of existing system used by other portions of site landscape without water for more than 24 hours at a time.

3.2 TRENCHING AND BACKFILLING

- A. Pulling of pipe shall be permitted on this project at the Contractor's option. Over excavate trenches both in width and depth. Ensure base of trench is rock or debris free to protect pipe and wire. Grade trench base to ensure flat, even support of piping. Backfill with clean soil or import material. Contractor shall backfill no less than 2" around entire pipe with clean, rock free fill. Main line piping and fittings shall not be backfilled until Designer or Owner's Representative has inspected and pipe has passed pressure testing. Perform balance of backfill operation to eliminate any settling.

3.3 SLEEVING

- A. Sleeve all piping and wiring that pass under paving or hardscape features. Wiring shall be placed in separate sleeving from piping. Sleeves shall be positioned relative to structures or obstructions to allow for pipe or wire within them to be removed if necessary.

3.4 GRADES AND DRAINAGE

- A. Place irrigation pipe and other elements at uniform grades. Winterization shall be by evacuation with compressed air. Automatic drains shall not be installed on this Project. Manual drains shall only be installed at POC where designated on Construction Drawings.

3.5 PVC Pipe

- A. Install pipe to allow for expansion and contraction as recommended by pipe manufacturer. Install main line pipes with 18" of cover, lateral line pipes with 12" of cover. Drawings show diagrammatic or conceptual location of piping—Contractor shall install piping to: minimize change of direction, avoid placement under large trees or large shrubs, avoid placement under hardscape features. Plastic pipe shall be cut squarely. Burrs shall be removed, spigot ends of pipes 3" and larger shall be beveled. Pipe shall not be glued unless ambient temperature is at least 50 degrees F. Pipe shall not be glued in rainy conditions unless properly tented. All solvent weld joints shall be assembled using IPS 711 glue and P70 primer according to manufacturers specification, no exceptions. All workers performing glue operations shall provide evidence of certification. Glued main line pipe shall cure a minimum of 24 hours prior to being energized. Lateral lines shall cure a minimum of 2 hours prior to being energized and shall not remain under constant pressure unless cured for 24 hours. Appropriate thrust blocking shall be performed on fittings 3" and larger. All threaded joints shall be wrapped with Teflon tape or paste unless directed by product manufacturer or sealing by o-ring.

3.6 CONTROLLERS

- A. All grounding shall be as directed by controller manufacturer and ASIC guidelines, not to exceed a resistance reading of 10 OHMs. Locate controllers in protected, inconspicuous place when possible. Coordinate location of pedestal controllers with Irrigation Designer to minimize visibility. Wire under hardscape surfaces shall be placed continuously in conduit. Pedestal controllers shall be placed upon VIT-Strong Box Quick Pad as per manufacturer's recommendations. Controllers shall be oriented such that Owner's Representative maintenance personnel may access easily and perform field system tests efficiently. Place Standard valve box at base of controller or nearby to allow for three to five feet of slack field control wire to be placed at each controller. This Contractor shall provide conduit access if needed for Electrical contractor. Electrical supply and installation, as well as hook-up to controller shall be by this Contractor.

3.7 VALVES

- A. Isolation valves, remote control valves and quick coupler valves shall be installed according to manufacturer recommendation and Contract Specifications and Details. Valve boxes shall be set over valves so that all parts of the valve can be reached for service. Valve box and lid shall be set to be flush with finished grade. Only one remote control valve may be installed in

a Rain Bird Standard size box. Place a minimum of 4" of ¾" washed gravel beneath valve box for drainage. Bottom of remote control valve shall be a minimum of 2" above gravel.

3.8 SPRINKLER HEADS

- A. No sprinkler shall be located closer than 6" to walls, fences, or buildings. Heads adjacent to walks, curbs, or paths shall be located at grade and 2" away from hardscape. Control valves shall be opened and fully flush lateral line pipe and swing joints prior to installation of sprinklers. Spray heads shall be installed and flushed again prior to installation of nozzles. Contractor shall be responsible for adjustment if necessary due to grade changes during landscape construction.

3.9 FIELD QUALITY CONTROL

- A. Main line pipes shall not be backfilled or accepted until the system has been tested for 2 hours at 100 PSI. Main line pressure test shall include all pipe and components from the point of connection to the upstream side of remote control valves. Test shall include all manifold components under constant pressure. Piping may be tested in sections that can be isolated. Contractor shall provide pressurized water pump to increase or boost pressure where existing static pressure is less than 100 PSI. Schedule testing with Irrigation Designer or previously designated Owner's Representative 48 hours in advance for approval. Leaks or defects shall promptly be repaired or rectified at the Contractor's expense and retested until able to pass testing. Grounding resistance at pedestal controller shall also be tested and shall not exceed 5 Ohms.

3.10 ADJUSTMENT

- A. Sprinkler heads shall be adjusted to proper height when installed. Changes in grade or adjustment of head height after installation shall be considered a part of the original contract and at Contractor's expense. Adjust all sprinkler heads for arc, radius, proper trim and distribution to cover all landscaped areas that are to be irrigated. Adjust sprinklers so they do not water buildings, structures, or other hardscape features. Adjust run times of stations to meet needs of plant material the station services.

3.11 CLEANING

- A. Contractor shall be responsible for cleanliness of jobsite. Work areas shall be swept cleanly and picked up daily. Open trenches or hazards shall be protected with yellow caution tape. Contractor is responsible for removal and disposal offsite of trash and debris generated as a result of this Project. Owner's Representative shall perform periodic as well as a final cleanliness inspection. Contractor shall leave Project in at least a 'broom clean' condition.

3.12 DEMONSTRATION

- A. After system is installed, inspected and approved, instruct Owner's Representative in all aspects of operation and maintenance of system, including programming and operation of Central Control System.

END OF SECTION